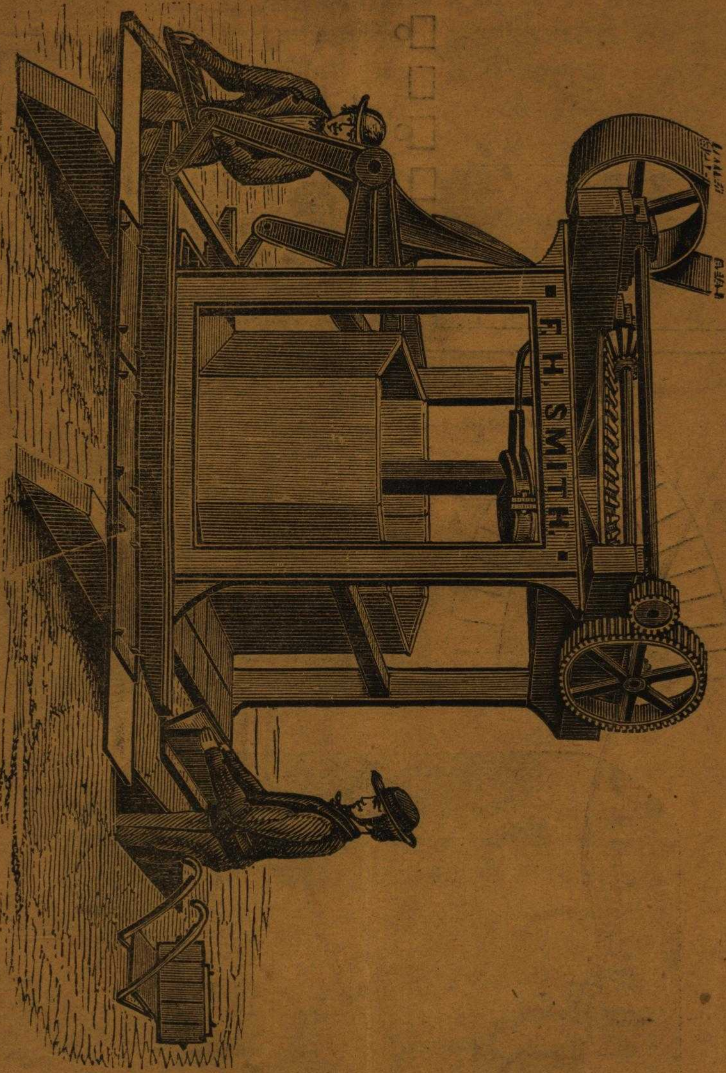
discard?

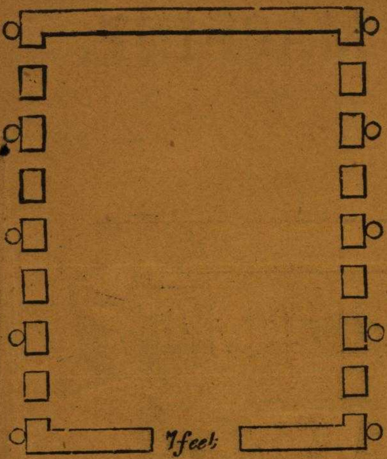
NEW BRICK MACHINE,

For Steam Power, $400.



In successful operation in Baltimore, since 1853.

FIG. 1.



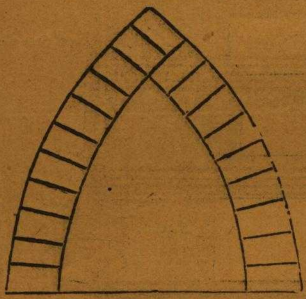
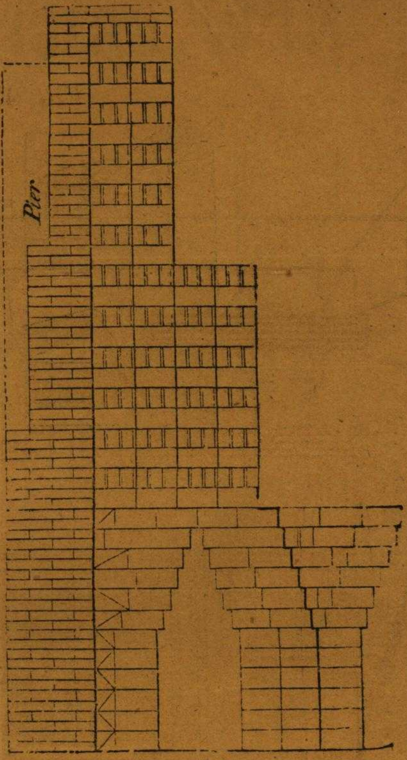


FIG. 2.

FIG. 3.



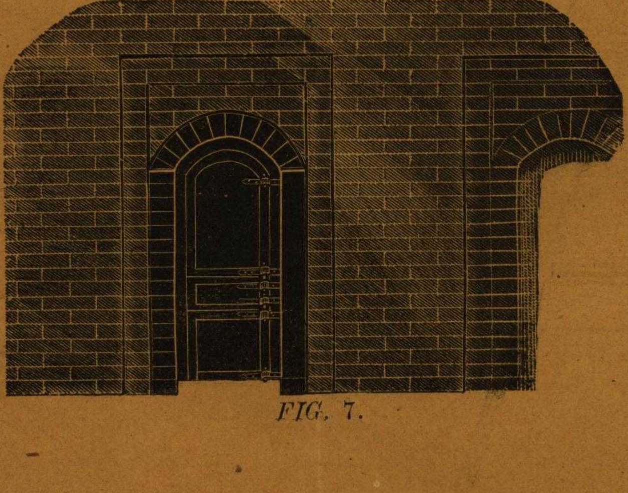
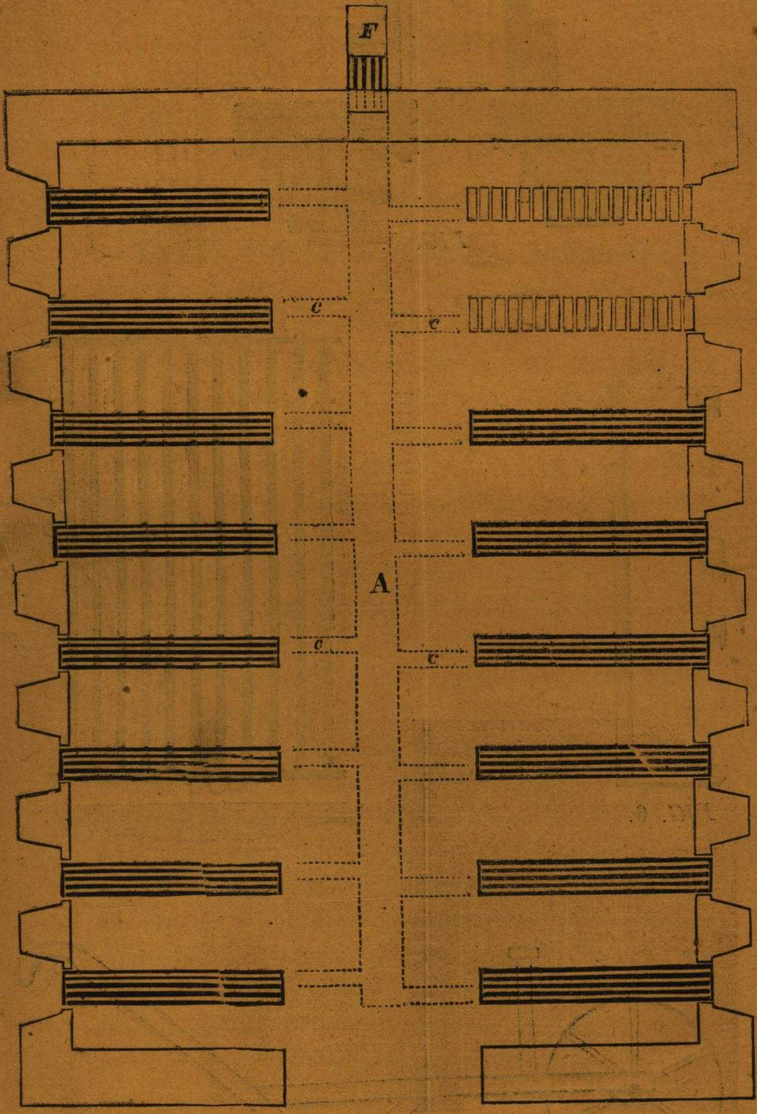


FIG. 7.

FIG. 4.



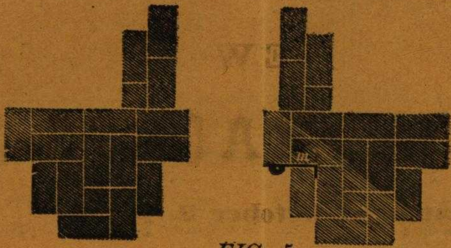


FIG. 5.

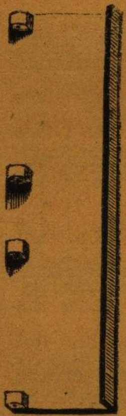


FIG. 6.

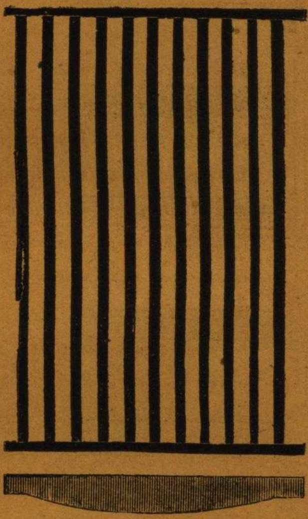
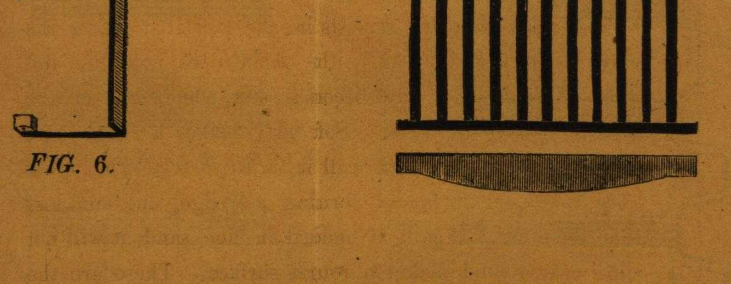


FIG. 8.



NEW
BRICK MACHINE,

Patented October 3, 1854,

By FRANCIS H. SMITH, Baltimore.

Of all the arts and handicrafts of man none show less the spirit of improvement than the art of brick making: the same primitive mode practised by the Israelites of yore still prevails. Frequent efforts have been made to introduce machinery, as the numerous models in the Patent Office show, many of them evincing considerable ingenuity; yet how few were put into practical operation, and even of these, not five, perhaps, may be seen in use at the present day.

The main difficulty consists in the fact that unless the clay be worked very soft, the mold does not fill; and if accidentally the clay becomes stiff, some part of the machine is sure to break. Soft clay makes a rough misshapen brick, or as some call it, *slush brick*—when cast from the mold it *squabs*, forming a wedge, one end less than the other. Again, if molded in fine sand, it will not slip—coarse sand makes a rough surface. These are the difficulties the inventor sought to overcome and has accomplished. Instead of attempting to fill the mold "in five seconds;" one-half of the revolution is occupied for the purpose—instead of operating at the same instant upon its entire surface, which measures *two hundred* superficial inches; only the lower flange of the screw, measuring but *five* inches, is thus engaged. At his yard in this city one may see the clay worked *in open molds* so stiff, that the brick will bear setting up on edge as soon as dropped: nor do the molds ever fail to fill—the pressure given by a peculiar adaption of the screw secures this.

I have tried many varieties of clay, but seen none yet that the machine will not work. No matter how stiff and tenacious it may be, the power of the screw is all sufficient to fill the molds. Every brick maker knows that the *stiffer the clay, the better the brick*—that it makes sharp corners and edges, is stronger and more solid, because there is more matter in a given space; less water to evaporate and consequently less shrinkage.

My bricks are molded in sand from Havre de Grace, the finest known anywhere, and yet not five bricks in a thousand are lost. No other machine does this. It is to this sand we are indebted for the beautiful color and fine finish of the Baltimore bricks, and this being the most difficult to slip, all other may be worked with ease.

Some clay cracks so much on the floor that a large quantity is lost before they can be secured under shed. The stiffness with which the clay is worked enables you to turn the bricks on edge within an hour, and thus the air being admitted on all sides at once the drying goes on equally, and the cracking prevented. Another remedy is to spread muslin on the bricks for four hours after they are dropped.

An admixture of sand is sometimes indispensable—if thoroughly incorporated, the brick is all the better for it, and is less apt to crack, both in drying and burning. This is so well done by the pulverizer, that it can scarcely be detected.

By Steam.—The sketch on the first page represents a machine with the necessary geering to be driven by steam or other power. To attach it, no other instruction is needed than to give the pully 168 revolutions per minute, which being reduced one-sixth by the spur and again one-fourth by the bevel, gives seven revolutions to the machine. As a mold of six bricks is produced at each revolution, the result is 2,520 bricks per hour, or 25,000 in ten hours.

The clay is taken direct from the bank and passed through a pulverizer, (not seen in the engraving,) which frees it from stone—water, pumped up by the engine, is conducted through a hose and thrown upon it as it falls in dust. It remains in soak all night, and is then ready for the machine.

Directions.—Provide two pieces of timber, 3 in. by 10, 8 feet long, let them in the ground even with the surface, 8 feet apart: cross these by two others 8 feet long, 3 inch by 6. To these bolt the machine. Corresponding letters and numbers show how the different parts go together. Having set up the sides put in the three lower cross-ties and two bolts, merely entering the nuts: then the middle ones. Lay on the bed-plate, step the shaft in its place, then the upper cross-ties and bolt up tight. Now mark through the lugs for the foundation bolts, and shove the machine on one side to give room for the auger; then bolt it down. This is followed by the arms and rock shaft, and lastly, the cog-wheels: nail the front and back boards to the cross-ties. Oil the eccentric and journal, and before you attach the connecting rod, turn the shaft round to see that you have not bolted up too tight. Then attach the rod and pass the molds all through slowly several times to see that all is right. Regulate the bed-plate by the set screws—the molds should scrape it in front, which gives a good surface to the brick and leaves but little for the strike to do, but at the back you will allow a little more space, say one-eighth of an inch, to let the molds enter freely.

Settle a box 2 feet square, 15 in. deep—at each end of the machine for the men to stand in—it makes it more convenient: these may be extended to receive also the boy who dusts the molds and the one who passes along the plates.

Provide a water box 22 in. wide, 10 in. deep, 2 feet 6 in. long, resting on a frame 18 in. high: into this plunge the mold. The *slipping* depends chiefly on *dry* dust, and to have the molds *well drained* before going into the dust box. To ensure this, place the water and dust boxes six feet distant from each other, but connected by two strips of wood on which the molds are to be slided down. These strips will hold five or six molds, and as the duster can only reach the one longest out of the water, it is sure to be well drained.

A frame of the following description placed in the water-box will also facilitate the washing. To a board 2 feet long, 12 inches wide, 2 inches thick, mortice six pieces 3 x 4, four inches long, clear of the tenon, the centre of each piece corresponding to the centre of each mold. On each of these nail a board 3-4 inch thick 3 x 7. On this lay two pieces of sole leather or india rubber belting, two inches wide, nine inches long—cover this with another board, on this more leather, and finish with another board, the whole confined by two screws or small boats. Confine it in the water box by a cleat on one side and a wedge on the other, so as to be easily removed when required. You have only to pass the mold once or twice over these pistons and it is well cleaned. As the leathers wear, loosen the screws and spread them out.

The box must be kept full of water, and the mud cleaned out twice a day; nor must this be neglected, for it soon becomes thick, causing too much dust to adhere and clog the mold. If this be attended to, they are more easily kept clean.

The mold being thus properly wetted and drained, plunge it into a dust box of the same size, lay it on the plate, and put both together on the rails. Mind, this should be done as the bar, in coming back, is about half way—lay it *on the bar*, tipping it forward until it touches the rails, still holding on until the bar recedes it drops in its place—then give the duster a shake and turn round immediately for another.

Place the dust box on the floor along side of the man who puts in the molds—keep the box always full, so that when the boy plunges in the mold it burys immediately and he has merely to give it a shake, tap it on the inside of the box and lay it on a board in front of him. Work very slowly at first, half speed; and before any clay is put in, let the men go through all the motions, passing the molds through, dusting them and all—continue this for a full hour.

As the mold appears in front, use the steel strike, giving it a quick motion diagonally—lay it on some dust along side—this will prevent the clay sticking, and keep it clean. A boy stands at his side to scrape the plate when necessary and pass it along the sliding board. As the mold is lifted up on edge, the plate drops off — the mold is passed to a light barrow holding four, edge up. A board, the length of the machine is placed on one side, resting on the sills—on this the plates are slid from front to back, and as it becomes full they shove each other along. See engraving. The plates should be made of planks 1½ inches thick. One is sent as a pattern.

An expert off-bearer will discharge the mold at a single turn; but a simple mode of doing this and perhaps the best, is to rest the mold on the floor with a light tap; then taking hold of the handles turn it over quickly and with some force—push it up to within an inch of those previously dropped and lift up square. You will not miss one in a thousand.

Provide a smooth board something larger than the mold—press it gently on the bricks as each barrow full is dropped, to give a true surface.

Be careful not to let the machine run unless you are putting in molds. There should be a binding pulley, lifted by a cord in reach of the man who attends to this, that if waiting for molds or any other hindrance occurs, he may stop the machine—the pressure of the screw is enormous, and it should not be suffered to run without giving vent to the clay.

The machine is worked by nine men and ten boys. Five men supply clay from the pit, two men to put in and take off the molds—two boys to scrape the molds—two boys to wet and dust them—one passes along the plates—four to wheel the barrows, one as a supernumerary to supply dust, &c. and two men to off-bear; these will make 25,000 in a day.

Extend a wheeling board entirely across the pit; give the wheeler a long handle shovel; let the barrow be without sides that it may be instantly discharged. These will easily keep a constant supply before the machine.

Anthracite Coal dust passed through a seive, No. 20, makes an excellent molding sand.

It is well to have a constant head of water; any good carpenter will make a tank of boards 1½ inches thick, 7 feet long, 5 feet wide, 4 feet deep—mount this on a frame 9 feet high, and keep it always full by the engine.

A drawing accompanies the machine, showing how to lay off the yard, the construction of the building, clay pit, &c. &c.

My steam machine is now driven by a small portable six-horse engine, which gives abundance of power. It was built by Poole & Hunt, of this city, and cost $650. It is complete in itself, and might be transported in a common wagon. The engine making 100 revolutions per minute, gives seven to the machine—occasionally it runs even eight to the minute. I have counted 13,000 made before noon. The average, however, is 25,000 per day.

During the whole of this year and the last we did not lose three hours from interruption, nor expend one dollar for repairs. except the breaking of a few molds. Price $400.

For the barrow-wheel, use a cast-iron pulley 16 inches diameter, four inches wide—this brings the rail 8 inches from the ground—the legs 8 inches—the rail 3 feet long—handles 2 feet long and 20 inches from the ground: four barrows will be wanted for the horse power, and six for the steam machine. All the barrows should have broad wheels—they rather improve the floors and render wheeling boards unnecessary.

The best wheel that I have seen for the purpose, is made by Poole & Hunt, Baltimore—light and cheap, for $2.

A new wooden seat will be required once in two or three weeks: it should be made of dogwood or hickory. To empty the clay box, it is only necessary to remove the sides, and two or three turns of the shaft will do the work.

The Pulverizer is a revolving shaft armed with teeth, set in a frame having also teeth in front and back, something like a thresher. The clay, in passing through this becomes reduced from the size of filberts down to dust. If a stone intervenes, it is caught by the teeth, which slips the belt to the loose pulley, when the stone is picked out, and the belt returned; causing an interruption of a minute or two. Where stone abounds in the clay, the pulverizer is indispensable; but even where there is none, particularly where steam or other stationary power is employed, it is well worth the trifling expense, as the clay is so much better prepared, especially when it is very tenacious, for small lumps of unsoaked clay will be dragged out by the strike, making an unsightly surface. The pulverizer cures all this.

The drawing shows how it is to be arranged. Place it level with the floor of the platform—dump the cart upon it, and half of the load will pass through without using the shovel.

The clay should be dry, the dryer the better. Keep the bank perpendicular, ready for a fall; with a few hours work always ahead exposed to the sun. If the clay is taken from the surface, the best mode of raising it is with the plough.

THE FOUR MOLD power machine is just like the one already mentioned, except in the number of bricks to each mold, and in being proportionally reduced in size. Price $250.

My attention was lately called to a stationary horse power, well adapted to either of the machines. It has one large wheel 12 feet in diameter, driving a shaft which is to be connected to the machine by a universal joint. It is built all of wood, therefore easily repaired, if necessary, and can be taken apart for transportation—the cost is about $125. During the winter it would be found useful for many purposes. It is calculated for one, two or four horses.

HORSE MACHINE.—The engraving shows one with cog gearing, by which the speed of the machine is increased to upwards of four revolutions per minute without changing the gait of the horse. The molds being lighter, it is attended chiefly by boys. Two men will wheel and supply the clay. A boy scrapes the molds. A stout boy will dust and put them on the rails—another pass them to the barrow—two will wheel them to the floor, and a sixth discharge. In all two men and six boys. This machine will make 10,000 bricks in a day. Price, $200.

The same machine, merely dispensing with the cog wheels, having the sweep attached to the main shaft, turns out 7,000. Price, $150.

Steam, however, is greatly to be preferred; and wherever there is a market for a million of bricks, should be adopted. It drives all before it, and keeps every man to his duty, for as every one has his allotted post, if any part of the operation is deficient, the idler is detected at once—you cannot expect such regularity from a horse. The more slowly he moves, the less have the men to do; and when your back is turned they are very apt to leave him to his own gait.

The entire weight of the machine is about a ton: the heaviest piece, 350 pounds—and, therefore, easy of transportation.

The machine is liable to no disorder except from stone—small pebbles will bury in the brick and thus do no harm, but a larger one is apt to break a mold. Yet even from this casualty the steam machine is exempt, because they are all removed by the pulverizer. If your clay is free of stone, the machine should run for a long time without costing a dollar for repairs: every part is of more than double the required strength. Extra molds can be supplied—6 m. $1.25—4 m. $1.00—shoes $3 per doz. pair for the small machines—$4 for the large.

I have yet to see the first practical man who does not pronounce it to be the most simple and efficient brick machine they have known.

THE LITTLE BRICK MAKER,

Is a smaller modification of the machine, adapted to the power of a man—molding one brick at a time. If he makes three and a half revolutions in a minute, the machine goes seven, thus turning out 420 bricks per hour.

Lay down two thick boards on each side of the machine, even with the surface, on which to rest the machine. You will find it convenient to rest the sides on a trestle until the frame is put together. Let the sweep be 16 feet long—bolt the centre piece 9 feet from one end, leaving the rest as a counter balance. If a horse or mule be used, the radius should not be less than 10 feet, as they require more room.

The clay should be softer than for the larger machines, or it would be too hard upon the man at the sweep. Let it be about the consistence for hand molding. A few hoppers full will show. Better to begin with it rather soft.

Have the soak pit near the circle. Use a flat bottom barrow without sides. The hopper will hold enough to allow time to replenish the barrow from the pit.

These two men may relieve each other if necessary. Wet the molds at first to make them take dust. You may also wash them occasionally, but, like hand-molding, they will be damp enough after this. Place the dust box, (which should be 12x15, 10 in. deep,) at the side of the machine opposite to that shown in the engraving—with a board at the back of it to serve as a shelf, on which the boy in front places the plate, convenient to the duster—two boys off-bear. Price, $70—extra molds $6 doz.

A country gentleman intending to build, can by this machine, make bricks with the labor of his farm hands, and find a brick house cheaper than one of frame.

I have seen a Pamphlet, by N. C. Raymond, of *Austin, Texas*, describing a new and cheap material for building. It is a "Concrete Brick," which requires no burning, and although ready for the wall in twenty-four hours after being molded, will yet sustain a pressure of 237 lbs. to the square inch. Any kind of clay or soil will answer; but from the chemical agents used, it cannot be worked by hand. All the bricks used for his own house were made with a trowel. The Little Brick Maker is the very thing for the purpose.

These machines are now used in many parts of the Union; with what success the following testimonials will show.

From the Baltimore American, October 15.

NEW BRICK MACHINE.

Among the many astonishing evidences of the power of machinery, and the perfection to which it has attained, none seem more worthy of examination and commendable notice than the steam brick works of Mr. Francis H. Smith. The proprietor has in constant operation one of his first class machines, for which a gold medal was awarded him by the Maryland Institute. Since that time, however, he has introduced such improvements as, in the opinion of scientific men, warrant the merit of a new invention. The *modus operandi*, nevertheless, is quite simple. The clay is delivered to the pulverizer which converts it into dust immediately, and incorporates it with the water thrown thereupon. In this state it is thrown into the machine, which revolves steadily, pressing the clay down into sets of molds, which move on a railway beneath. The molds are then transferred to a light barrow, moved to the yard and discharged in the usual way. The clay is worked much stiffer than it can be done with the hand, and gives a solidity to the brick and correctness of form rarely equalled.

We next saw in operation, a similar machine, worked by a horse, with the same result—the bricks being equal in every respect and fifteen made per minute. Machinery has hitherto been directed to work either the dry clay or soft mud. The present invention is intended for a medium between these extremes, and to mold the bricks from clay tempered to a consistence fit for the potter's wheel, or suitable for front brick, and consequently, in quality, they must nearly resemble the latch brick.

The work is performed by ordinary laborers, chiefly boys. The extreme difficulty of applying machinery to the rapid performance of such peculiar work, the simplicity of construction, thus greatly lessening the liability of accident, and the moderate cost, have resulted from the invention, besides, there is no time for trifling amongst the operators. Each person must be promptly at his post, and is obliged, to move briskly at his work, for the machine will not allow laziness nor indulgence—it waits for no one.

By the Maryland Institute.—"The bricks made by it are well formed, substantial, and all that can be desired."

By unanimous vote, Gold Medal awarded. Also, Premium given by the Maryland State Agricultural Society.

S. T. Brown, (*plain four-mold,*) Washington, N. C. writes September 16, 1853. "The machine is doing very well indeed, and meets my most sanguine expectations."

1854, May 13. "I am doing very well—more than ever pleased with the machine, making 7,500 a day with ease."

1855, November 17. "I am well satisfied with my work this season—made more bricks by many thousand than I did last year in proportion to the hands employed. The machine worked admirably; sooner than return to the old mode, I would abandon the business."

James Hicks, (*plain four-mold,*) Buck Eye, Lawrence Co. Geo. Oct. 17, 1853. "We are making 8000 bricks a day. The machine is all that you have promised for it."

Oct. 24, 1854. "I think still better of the machine and would not willingly be without one. When asked my opinion, I say that if I had 200,000 bricks to make, I would purchase a machine rather than make them by hand."

In 1857, Mr. Hicks, wishing to have the benefit of the latest improvement, sold his machine and bought an improved four-mold. He writes August 31: "It performs very well, much better than the old one—we can make 10,000 a day with ease."

Geo. Aler & Co. Fredericksburg, Va. May 30, 1854. "We have been working the machine for some time and are much pleased with it. The bricks are certainly superior to the hand made in every particular."

D. E. Smith, Wilmington, N. C. April 13. "The machine performs admirably—we average 8000 per day. May 24. The more I work the machine the better I like it. We now make 10,000 per day easily."

Jas. P. Bartlett, (*four-mold,*) Clarksburg, Va. July 16. "I am getting along very well and hope to send you another customer." Oct. 7. "I am doing first rate with the machine and making bricks fast, at least 8,000 a day."

Geo. C. Custer, (*plain-four mold,*) Nevin, O. July 26. "We are just getting under good head-way. The best test we have given it yet is 500 bricks in thirty minutes."

Mr. C. bought a four-mold in 1854, *previous to the improvements, which it seems he has himself applied to it.*

"I set up the machine with nearly double gear, so that the horse in four times round passed out seven molds—we made 1,200 per hour. The machine does admirably well. The bricks made are of excellent quality. It is quite probable I may get another from you, for yours is the best I have ever seen

Jno. Tyler & Son, Scottsville, Va. "We are getting on very finely indeed; making just as good bricks as we desire.

Daniel Hartlett & Co. Albany, Geo. Nov. 27, 1854. "The machine is working finely."

Wm. S. Wallace, Americus, Geo. Dec. 9. "Your machine is the very thing for the South, for generally we have poor clay, which, when molded by hand, makes an open spongy brick; but your machine presses the clay together and makes it close and compact—in fact it comes up to all you say of it."

John Kierans, Weston, Louis Co. Va. Dec. 10, 1855. "I recommend the machine to brick makers, as they perform what they are stated to do. I have made 1,000 bricks in fifty-four minutes."

J. C. Washington, Kingston, N. C. Oct. 4, 1855. "The machine is doing well, making 8,000 or 9,000 a day—in summer it can make 10,000. I shall have to purchase another, or one worked by steam.

John A. Minniece, Gainesville, Ala. Oct. 24, 1855. "We have made frequently over 1,000 an hour."

James P. Bartlett, Clarksburg, Va. Nov. 13, 1855. "I can say I am better pleased with its work this year than ever, I make as good bricks with the machine, and more than I did by hand. Next year I shall only use the machine."

Albert A. Miller, Glen Rock, Pa. Dec. 17, 1855. "The weather has been very unfavorable for brick making, but I succeeded in getting out five kilns. I have saved fifty per cent. over the old way of molding by hand, including all casualties."

James C. Adams, Baltimore, Dec. 20, 1855. "I had one of F. H. Smith's 5 Mold Steam Brick Machines in operation this year at Mount Washington, five and a half miles from this City, and I consider it a good machine. I had much trouble from the extraordinary quantity of stone found in the clay there; but free from this difficulty, I have no doubt but that 20,000 bricks could be made per day."

Newbern, N. C. Sept. 24, 1856. (5 *mold*) "I have delayed giving you my opinion of your Brick Machine until this time, because I desired to be just as well to those who might be influenced by my opinion as to yourself. After surveying my operations for the past summer I can confidently say your representations have been fully realized. I have frequently made 22,000 bricks per day, though we took 20,000 as a task, and accomplished it *invariably* when we had no interruption. I have been engaged in the manufacture of bricks for many years, have used and examined many machines, but for simplicity, durability and efficiency have seen no machine for using tempered clay to equal yours. It has been worked through the whole season without an accident to delay us one hour, or to cost one dollar, except the breaking of perhaps five or six molds. Is is a perfect machine of its kind. The bricks when well burned are harder than New York hand-made bricks, with which I tried them, and the salmon are of better quality than any I ever saw before. H. J. B. Clark.

C. W. Hooks, Livingston, Ala. Oct. 27, 1856. "The machine works as well as could be expected. I started with a 24 feet circle and it made at the rate of 1224 bricks per hour. But the lever is too short—I shall have it 28 feet."

H. M. Bry, Munroe, La. Oct. 25, 1856. "The machine I got of you works well. I made from 8,000 to 9,000 bricks per day, and could by "rushing" make from 1,000 to 1,200 per hour. It is certainly the best brick machine I have seen, and no one having over 200,000 bricks to make should be without it."

Fletcher, Pyne & Co. Quincy, Ill. opened a new yard in the spring with a 5 mold steam machine. Their letter of Oct. 22, says:—"We have made nearly 1,500,000 of bricks, and can make from 15,000 to 25,000 per day, and do believe that could we take them away from the machine and feed it with clay, that we could make 40,000 per day."

Geo. W. Miner, Pictou, N. S. Nov. 2, 1856. "Your Brick Machine works well—it fills the molds most effectually, and shoves them out as fast as one man can strike and put them on the barrow. I believe it will do all you promised for it."

Jonathan W. Old, Princess Anne C. H. Va. Nov. 20, 1856. "Your machine worked to my entire satisfaction. My only doubt was as to the tempering; I find the clay better tempered with the machine than it is usually done with a spade. I can mold 10,000 per day of ten hours, taking the coolest part of the day for work. Any common farm hands can work it.

The Little Brick Maker, 4,000 *per day*, ...	$70
A Plain Four-Mold Machine, 7,000 *per day*, . . .	150
The same, with Improved Gearing, 10,000 *per day*, .	200
The same, to be driven by a belt, 16,000 *per day*, . .	250
Six-Mold Machine, for Steam or Water Power, 25,000 *per day*, ...	400
Pulverizer, ...	50

I shipped a machine and engine to a gentleman in Albany, Geo. including counter shaft and pulleys, pumps and fixtures, hose, pipes, 12 barrow-wheels, all complete, for $1,250.

Copy of a bill furnished to a gentleman of South America for Stationary Horse Power and two six-mold Brick Machines, making 50,000 *bricks per day, with all the necessary duplicates, in case of accident.*

The Horse Power and extra Cogs, - - - - - - -	$125
2 Machines, - - - - - - - - - - - - - - - -	800
60 Extra Molds, - - - - - - - - - - - - - -	75
1 Rock Shaft and 1 Screw, - - - - - - - - - -	27
4 Bars and 4 pair Shackles, - - - - - - - - -	10
6 Doz. Shoes, - - - - - - - - - - - - - - -	15
Bevil Pinion, - - - - - - - - - - - - - - -	5
2 Pulverizers, - - - - - - - - - - - - - - -	100
2 Shafts and Backs, - - - - - - - - - - - -	20
Packing Boxes and Drayage, - - - - - - - -	20
20 Sets Kiln Doors and Framer, - - - - - - -	56
2 Turned Shafts 2⅝, 4 feet long, with Hangers, &c.	26
4 Turned Pullys, - - - - - - - - - - - - - -	29
2 Shafts, 10 feet long, with Universal Joints, - - -	40
Force Pump, with Shaft Pully, Valve and Fixtures, -	30
12 Mold and 20 Brick Barrows, - - - - - - - -	160
Hose, Belts and Leadpipe, - - - - - - - - - -	60
2 Brass Cocks, Boxes and Drayage, - - - - - -	12
	$1610

BALTIMORE, *September* 17, 1857.

Oct. 3. Since the above was in type, I have learned from Mr. Clark, of Newbern, his mode of arranging the soak pit, which is, I admit, an improvement. The pit is 36 x 18, dug 4½ feet deep. The *side* of the machine is placed close to it; and extending from it, in the pit, a platform 14 x 7; on which the clay is thrown by two men in the forenoon, with another to assist in the afternoon. They use a short handle shovel at first, and a weeding hoe afterwards—with this they can reach the clay from the remotest part. Thus the barrow is dispensed with.

BRICK BURNING.

The following article was contributed for the New York Scientific American, in which it appeared October 1, 1853. *It is copied here for the benefit of my correspondents.*

I have just returned from a trip to Virginia to witness the successful operation of some of my new Brick Machines, and was astonished at the want of information which prevails away from the large cities, in regard to brick burning and the proper construction of kilns. The bricks are set with but little judgment, and burned with still less.

During the twelve years that I have been engaged in the business, always ready to profit by the experience of others, and avail myself of recent improvements, I have picked up a good deal of information, and this I propose to embody in a few plain, practical instructions, so that there shall be no mystery about the matter, and every farmer, if he pleases, may make his own bricks.

Much that follows will appear trite and common-place to an experienced hand, but I am addressing a country gentleman who wishes to burn a kiln for his own use, with the labor of his farm hands, and is supposed to be entirely ignorant of the business. Keeping this in view, I shall not omit those trivial points upon which success often mainly depends.

I need say nothing about the molding. Let us suppose that your bricks are dried, under cover, and ready for the kiln; the length, breadth, and height of which is governed by the size of the brick. Prepare a stick the length of two bricks, and another the length of three, and make a notch in the latter, dividing it equally; provide also, a strip of wood eight feet long and three inches wide as a straight edge.

Along what is to be the back of the wall, figure 1, stretch a line the length of thirty-four bricks, and at each extremity stretch a line at right angles with the first. This shows a parallelogram the width of the kiln. For the length apply the notch of the stick, which measures a brick and a half, to each corner; to this apply the other which represents the arch—then, the full length of the first stick, which now lays off a pillar, and so on alternately until you have marked off eight arches; the half of the long stick then completes forty bricks in length, each arch being five: at front, allow for a door seven feet wide. Do not regard a little extra trouble in building the walls; it will repay you. With care, every brick that goes in, except the binders, will come out sound; not, as I was told in Virginia, "glad if only a fourth were lost."

The bricks in the walls may be turned to good account for "filling up" in frame buildings. The walls should be built according to rule; a mason may be employed to raise the corners and turn the arches; your own hands will soon learn to lay to the line and fill in well enough for the purpose. Build with dried bricks laid in mud. Prepare a frame to turn a Gothic arch for the holes, twelve inches wide at the bottom, and fourteen inches to the highest point. The walls should be two bricks thick from the foundation to one foot above the arches; when this is completed, prepare for the roof. Plant posts in the ground, one side hewn straight to go next the wall; place one at each corner, and three between them making five on a side. On these lay the roof, giving it a good pitch, the boards may be laid edge to edge—no rain will drive through to do harm.

Now run up the remainder of the walls a brick and a half for the next three feet, and one brick to the top; but against each post keep out a pier, as shown by the dotted lines, to bind it all the way up. Daub it then well, inside and out with clay and sand (two-thirds sand) to prevent it splitting off as it dries. This kiln set thirty-six bricks high will contain 140,000; two such would do a good business for a small town.

If fewer bricks be wanted and you only wish to make a single kiln, take the following cheap mode of putting up a *clamp*. Lay off the inside lines for six, seven or eight arches as before directed, and set in the posts as in fig. 1, allowing the length of a brick and a half between the posts and the lines Put on the roof and the sheds and under this the bricks are to be haked ahead of the setters.

Set the bricks on edge as soon as convenient—the next day hake them on the floor in rows eight high—the fourth day you may bring them into the kiln ready to set, but if the weather is fine and you can let them remain one or two days longer, all the better. Begin to hake them in rows six feet from the back wall—they will then be convenient for the setter. Continue in this way until the whole kiln is set. For the outer walls you have merely to pile up bricks against the kiln edgewise all around, turn the arch holes as before, daub it well taking care to secure with thick boards and braces as you proceed. All now depends on close attention to keep it well daubed and exclude the air. If this be done, even the outer casing will be good enough for chimneys and division walls and almost every brick that you have molded be turned to good account.

SETTING.—First, see that the floor is perfectly level; place the straight edge the width of a brick from the back wall, and against it lay the first course half an inch apart; cover this with another, not breaking joints, then a tight course. Behind these lay three courses angularly, and crossing each other.

Repeat all this, that is two open, one tight, and behind them, three courses regularly crossing each other. Place the straight edge the length of two bricks from those laid, and repeat the six courses, as in fig. 3. Now commence the overhangers to form the arch, each course projecting about an inch. Lay them finger wide, first breaking the joints; the thirteenth course will bind all together. Now fill in behind, a whole brick when you can, and those angling behind them. Next comes the middle bricks; these have no tight course, but are finged wide apart, and breaking joints—they will be among the best bricks in the kiln.

The strong black line, fig. 3, shows the rounding up of the first arch. Having reached the top, there are four bricks in length from the back wall—this forms the "bench." Use now a board to stand upon and begin at the right-hand corner to raise the columns, three upon three, crossing all the way up, but be careful that they stand independent of each other; no overlapping, for if the kiln settle irregularly, many would be broken off. Begin with four columns, and carry them up ten bricks higher; this forms a second bench to stand upon for topping out. Continue two of them thirteen courses high, which brings you to the top. Finish with the first course of platting laid flat, finger wide between the rows, but end to end running with the arch. The second course of plattings crosses these. The first course covers the kiln all over, but the second course is left off for a space three feet wide in the middle, and bricks are piled on the wall to be put on after the kiln is dried.

By referring to figure 3, you will see how the spaces over the middle bricks are to be filled. The seventh and tenth courses show the head of *one* crossing the others; the eighth and eleventh courses show *two*. These should all be placed an inch apart to let the flame circulate freely.

Having rounded up the second arch the same as the first, mount the bench and carry up five courses, leaving the offset throughout to serve as a brace to keep the rest from falling. I forgot to observe that it might be well not to finish the wall until you have topped out the setting, so as to ascertain the exact height. The last six courses of the wall are all headers, laid dry, which forms the casing. As the kiln shrinks in burning and settles off from the wall, this casing is driven up so as to keep all tight on top. The kiln being filled, close the *bestowing* opening, daub it well and throw earth along the bottom to exclude air. Put up a brick edgewise on the wall over the second, fifth and seventh arches, and ranging with them, three others along the middle of the kiln; make the three in range level with each other. By these you are to judge of the settling, and they form the only guide to know when the kiln is sufficiently burned. On each middle brick, place one on end, and as these disappear below the range of those on the wall, the degree of settling is ascertained. Sandy clay shrinks less than that which is strong and tenacious; allow about seven inches for settling. A brick shrinks in burning about as much as it does in drying—therefore if it lost in width one fourth of an inch, then thirty-six courses will settle nine inches.

As the walls of a clamp are only one brick thick, put up after the kiln is set; begin three feet from the ground in setting to fall back, so that the top of the wall shall be four inches within a plumb line.

Before fires are kindled the walls of the kiln must be made secure all around. Against the posts put up a shedding to protect the men from the weather; if this is well done it will operate as a good brace on those sides. Put up against each end wall three thick boards or slabs and brace them well with stout pieces let in the earth.

BURNING.—Let the wood be dry and well seasoned: it will consume less and the bricks will be better burned. The usual estimate is half a cord to the thousand, but it seldom requires so much. Begin with small dry sticks in all the mouths—it will burn slowly at first; all the better; the danger is in getting up a heat too fast. I have suffered the fires to go out the first and even the second nights, and always with decided benefit.

The water smoke must have time to escape slowly,—push in the burning brands and get a moderate fire through all the arches. Throughout the burning, keep it as equal as possible; never let one arch get ahead of another. As the water smoke disappears, fire up stronger, especially when the arches get red, and fire begins to be seen at the tops.

The water smoke will first disappear from the heads, over the mouths. Immediately close the platting with a spade or hoe, moving two or three rows together until you have space to drop in a brick, and so follow up as the fire shows from above. As you approach the vacant space before mentioned, continue to close up until the whole is covered. This vacant space is of great importance, it serves as a flue to draw the fire to the middle, prevents cold spots, and renders the kiln more manageable.

The kiln being dry, and platting closed, fire away, all the mouths open; feed each alike as nearly as possible, be sure and keep the mouths full and as they settle down force in a stick whenever you can find space for one as big as your arm.

Give the arches time to clear, that is, do not fire upon a heavy bed of coals when the arches are very hot. Give the coals time to burn down a little, but never suffer a spot to get dark—keep the heat up to the end. Continue thus on both sides until the middle is started two inches, then prepare to close the windward side; have six choice sticks ready at each mouth, the bricks at hand, and a barrow of mud to close quickly. Push in the brands, off hand the wood, lay in the bricks, daub over well, and throw earth against the bottom, and then fire from the other side. Provide the cliffs for each mouth (choice sticks enough to reach across,) the same number for each, and lean them up that they may be drying and at hand. Proceed as before, using the same precautions against firing upon a heavy bed of coals, keeping the mouths always full, and continue until the opposite head has settled nearly enough; the remainder will be brought down when you turn for the other head.

The same course is now to be pursued on the other side, until the kiln is sufficiently settled, taking care as you open one hole to close the corresponding one opposite. If you have been careful to distribute the wood equal throughout, the kiln should appear nearly as level when burned off as it was when set on fire.

Throughout the entire burning, whenever a crack appears shut it up. As the kiln settles and shrinks from the walls, drive up the casing, and as this breaks the daubing, daub it again. The air *must* be excluded.

If high winds prevail, boards must be nailed against the posts as high as three or four feet above the walls, and if that side be then open, the mouths must be protected also.

FRANCIS H. SMITH.

HOT BLAST BRICK KILN.

The mode of burning, which I am about to explain, is the result of many years experience, attended with many trials and disappointments. Much of the time was devoted to the use of bituminous coal as the fuel, and for that purpose I built a kiln expressly as an experimental one. It was altered and re-altered again and again; at one time many of the bricks burned up, at another, nearly all salmon. My progress was watched with interest by others of the profession, and some of my abortions have been imitated and put forth to the world as new.

It was in the course of these various trials that the present novelty was reached, by which the process is rendered so simple, that any intelligent person, by pursuing the instructions here given, may burn without the possibility of failure, and, if desired, almost the entire kiln burned *hard*, and all with but a fraction over a quarter of a cord to the thousand. One peculiarity in it is, that, owing to the extraordinary draught, the top course is as hard if not harder than the arches. I have not yet seen an arch *stuck.*

It has been shown in the preceding pages, that by keeping all the mouths open and firing from both sides, the heat is concentrated in the middle, and thus settles that part. It has been also shown, that to bring down the sides, the heat must be thrown on one at a time, by shutting up the mouths on that side, and firing from the other, and when this is done, bring down the opposite head in the same way.

The present invention aims at settling both heads at once, which is effected by creating the draught just the reverse of the old method:—*it comes from the middle.*

The principle is the same, whether applied to the use of wood or coal.

In the cut, Fig. 4, you have a ground plan, substantially the same as Fig. 1. Beneath the floor is a flue, (A,) shown by dotted lines, 20 inches wide, 20 inches high in the clear, arched above to give it strength, or covered with old stove plates, running the entire length of the kiln, with an opening at the back (F) for a furnace by which all the air which feeds the kiln is heated, as hereafter described. Lateral flues C. C. 12 inches wide communicate from (A) to the ash pits.

Fig. 5 shows how to lay the first course, which gives the foundation of the kiln.

Fig. 6 is a view of the frame, on which the doors are hung; it is 2.3 long, 8 inches wide, $\frac{1}{4}$ of an inch thick, with a flange one inch wide on one side—has four legs with $\frac{5}{8}$ holes cast in them for the doors to hang upon, built in the wall at *m*.

Fig. 7—enlarged view of one of the mouths.

Commence by levelling a spot of the proper size for the kiln and surrounding sheds. Lay one course for the walls, as shown in Fig. 5. On this place the frame, Fig. 6, and run up four courses. The ash pits should be one course deeper, and therefore, five courses for them brings all to the same level.

In Fig. 4 is seen two of the ash pits, arranged for burning with wood. Instead of grates, which would pass more air than is needed, you will contract the upper part of the ash pit, so as to receive a brick on edge, placed one inch apart: they should be made for the purpose, half an inch less in thickness on one edge than the other, which you may shave off with a knife before it is burned: this lets the ashes through easily. These bricks on edge are even with the kiln floor and not sunk below the level, like the coal grates mentioned below; they should be good and strong. If the clay is weak, the bricks made of it are not to be trusted for the purpose. You must then use gratings 9 inches long of three bars, $\frac{5}{8}$ thick at the upper edge, $\frac{3}{8}$ at the bottom; $1\frac{1}{4}$ deep; space between the bars $\frac{3}{4}$ inch.

These cost 33 cts. each: four of them to each mouth are sufficient, with bricks on edge between; these form the floor of the kiln, *which is to be fair with the top of the ash pit door.* There is no objection to sinking the entire kiln four or five inches below the outside level, if required by the nature of the ground; but I prefer to start, on a level, and throw up earth at the bestowing for the road into the kiln.

The middle part of the floor should be paved with brick on edge; the bats and rubbish of the kiln will serve. Salmon bricks, laid flat, will do for the sides.

So much for the construction: now for its management. Do not hurry matters that you may say in how short a time the kiln was burned. Begin with all the doors open, and moderate fires, gradually pushing back the brands so that in twenty-four hours they reach across the kiln, with not more than two or three sticks together. This caution must not be disregarded or you will soon hear the bricks begin to burst. In the old mode there is but little danger of this, for it is with difficulty the wood can be made to burn at all, and only at the mouth; and it will be thirty-six hours before they can be made to meet. All the better—no more is then required. Never hasten while the water smoke is coming off freely, but when that becomes thin you may add more fuel; the danger is then over. If you have coal it is best to dry the kiln with it, as there is less danger of heating too fast.

After twenty-four hours you may increase the fire to three or four sticks lying together, and continue so until the water smoke becomes thin and flickering.

You were directed in page (21) to leave off the middle third of the upper platting. It is well also to remove two courses next to the wall all round, ready to be returned when the water smoke is gone; indeed, but for the difficulty of putting on so much of it when the kiln is hot, it would be better to have it all off, that every facility may be given to the free passage of the water smoke.

In about forty-eight hours the two courses above mentioned may be restored: then close the upper door, and fire a little stronger. In about three hours the arches will be red.

Keep your eye upon the top of the kiln and as fast as the fires appear, close the platting, and throughout the burning, watch the wall to daub up every crack the moment it appears.

The fires being up and the platting closed, shut the ash pit door, daub it up tight, not to be again opened; and make a good fire in the mouth of the main flue, to be kept burning to the end.

Fire away now as strong as the arches will bear, but so good is the draught, that there is far less danger of melting them than by the old mode.

As soon as there is a settling heat upon the middle, shut the middle door—the heat is now driven to the heads. Now, you will understand why the grating does not extend across from one head to the other; if so, the air, when admitted through the flue A, would be dispersed in the middle, then the hottest part, instead of being driven to the heads. If you have been careful to feed every part of the kiln alike, you will see it going down level all over, but if a lump appears in the middle, open the middle doors of that arch an inch or more, and you will see the black smoke coming from the lump, showing that the heat is driven to the spot you want. If, however, the middle has settled too fast, put less wood under that part. By attention to these simple rules every part of the kiln is under control.

You will find that the wood next to the doors burns out faster and must be renewed twice as often as in the middle, for the grates should never be left naked. To remedy this, I have placed there a grate twelve inches by fifteen for coal, either anthracite or bituminous, which exactly meets the difficulty; but if you have no coal, feed oftener at the mouth The wood should not be large—if small, it gives more flame, which is what you want. It will pay to split it up if necessary.

Coal.—For burning coal, let there be two flues (A) running along the ends of the ash pits.

Fig. 8 represents a grate, 2.4 long, width over all 14 inches; bar 5-8 thick at the upper edge, 3-8 at the bottom; 1¼ deep; space between the bars, 5-8; three of these form a grating.

It will be observed, that they extend on each side about 6½ feet—the middle part of the floor, which is 8 feet, remaining unbroken: the reason for this is already given.

The grates, when dropped in their places, should have an inch of freedom all round, to prevent being warped by the heat. They should be eight inches below the floor level, and thus the coal, which should not exceed six inches in depth, will leave the bottom courses uninjured.

Keep the grates free of ashes, by raking them through the middle door. For this purpose use a bar of inch round iron, 10 feet long, having the end turned square 2½ inches long; provide also another bar of same size, having one end, 12 inches long, 3½ inches wide, flattened like a chisel.

Clean out the ash pits morning and evening: never open the upper door except to feed; regulate the quantity to each mouth—two, three or four shovels full as required; scatter lightly over the surface: in ten minutes it will coke; then follow with the poker and loosen it gently.

In firing with coal you will require two hands, one to stir up, the other to feed. As soon as you have served all the mouths, begin again with a poker, through the small door, for by this time the coal will have coaked and should be broken up. It is just at this moment that you derive from it the greatest benefit, and this stirring should by no means be omitted. It will cause the kiln to settle several hours sooner, and save several tons of coal. Thirty-six tons of coal should burn two hundred thousand bricks.

The same general directions that have been given in the use of wood, apply also for coal.

The roof which I am about to describe is more expensive to build, but the cheapest in the end. Of course, it only applies for an established yard.

The posts to sustain the roof should be from 10 to 12 inches diameter, extending 9 feet above the walls—a plate 3 by 9 rests on these all round, well fastened at the corners. Rods of ½ inch iron extend across at the top, from post to post: on this rests a *hipped* roof, for safety in high winds. Begin with boards 16 feet long, extending 2 feet beyond the plate The boards of the second tier project a few inches, enough to protect from driving rains; but there is to be a space between the tiers of 9 inches, which serves as a ventilator to let the heat escape. Just at the apex of the roof, leave a space of 8 inches for the same purpose, covered by a board, which is to be removed when the kiln is on fire. There is but little danger from fire in such a roof. I have had them in use for ten years.

It is very important to shut in the top of the kiln, especially in high winds. To nail up boards on every occasion; to change them as the wind shifts, is attended with much trouble and expense. You will find it economical to put up a permanent shelter in the following simple mode.

Having provided a number of boards about 5 feet long, leave a pin at the middle of each end 1½ inches long: this forms a sort of Venetian shutter. They are to be set upright into strips 3 inches wide, nailed to the outside of the posts;—the shutters may be 10, 11 or 12 inches wide, but each width alike in a panel. If 12 inches wide, the holes in the strips must be 11 inches apart. Thus, in a few minutes, the windward side may be closed, and the opposite opened.

The engraving shows at one end an arched door, 8 feet wide, 7½ feet high at the crown; pass an iron rod, 7-8 of an inch diameter, through the centre of the wall, just above the turn of the arch, and through the posts on each side, secured by nut and washer. A similar bolt extends through the side walls, just above the mouths, and another along the top of the wall, both secured in like manner to the posts on each end. Select eight of the largest posts for the corners. This will prevent the wall from falling outwards. To keep them from craving in, I have found the following simple method to prove effectual:—instead of running up the inside *plumb*, let the middle part of it *batter back*, until the top of the wall is 4 inches from a plumb line. The corners are to be plumb, therefore the top edge on the inside will shew a curved line, in fact an arch. The corners or abutments being sustained by the posts, and secured by the long bolts or rods above mentioned, the wall cannot yield:—mind, it is only the inside that is curved—the outside is straight.

To adapt a kiln of eight arches, already built, to this plan, will require two laborers a week for the excavation, and three masons the same length of time to build the flues, &c.

The frame and three doors cost $2.80; but if wood be the fuel and you wish to economise you may dispense with the lower door and use bricks daubed up to close with—the frame and two doors cost $2—this, however, will not answer for coal as the ashes must be often removed. The grates at the mouth for wood $1—for coal $2.50 each.

One set of grates and doors will serve all your kilns.

It will save the cost of patterns for those convenient to this city to order the castings from POOLE & HUNT.

The right for a kiln is $50—for a yard $100. No charge is made to those who adopt my machine.

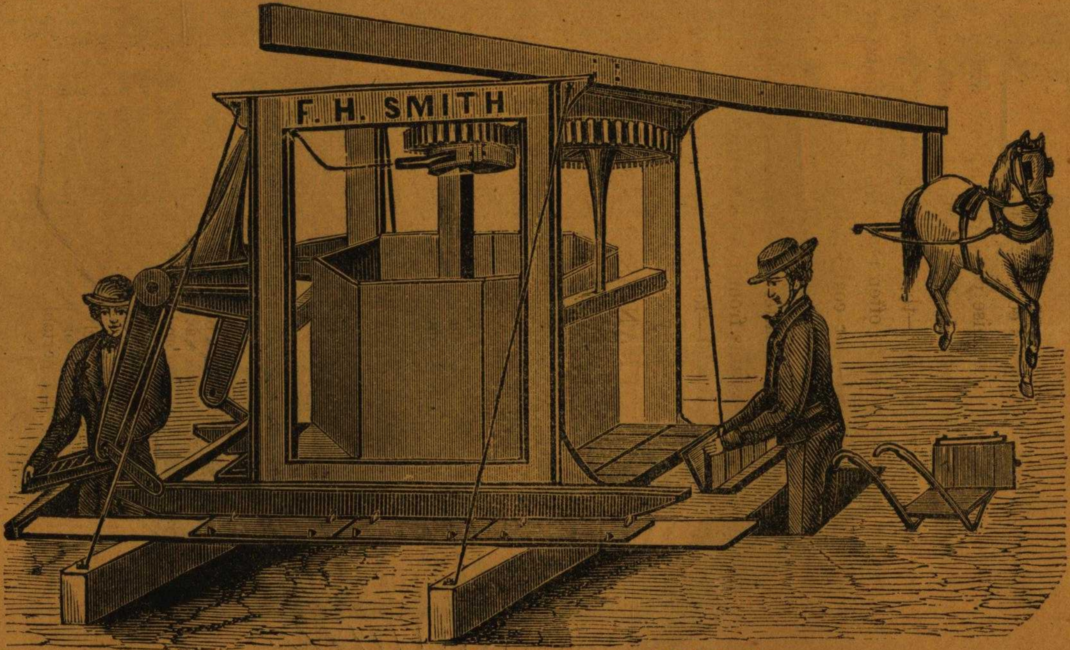
FRANCIS H. SMITH,
Sun Building, Baltimore.

Extract of a Report of the Chief Engineer of Baltimore Water Warks,
Sept. 10, 1857.

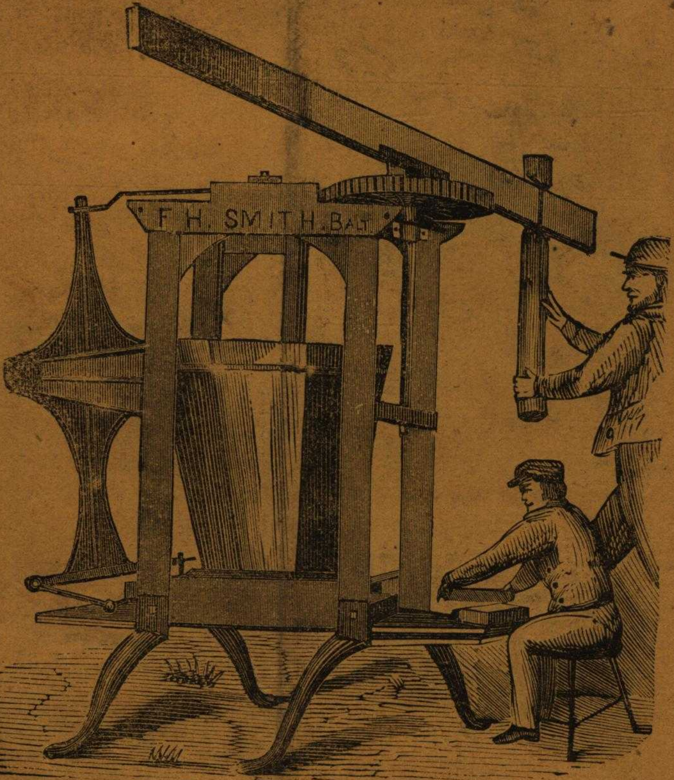
"These brick can be made well and cheap by a *brick machine*, patented by F. H. Smith, Esq. who has extensive brick works on Locust Point, and in constant operation one of them, which turns out 25,000 bricks per day.

"I find the bricks made by this machine to be very *firm, dense* and of more than ordinary weight, and when broken, to exhibit an excellent grain and crystalization. It is the general impression that *machine bricks* are made of untempered clay, and of course, comparatively worthless; but I had a good opportunity to satisfy myself that the clay used by this machine of Mr Smith's undergoes an excellent course of tempering. It is first *ground* by machinery in fine particles, and then spread out in thin layers in a pit, and water applied over the surface, Then another layer of this ground clay, and more water, and so on, layers of clay and intermediate wettings. From this bed it is taken to the machine. With these several handlings, together with the mixing and cutting effect of the vanes, the clay becomes well tempered and in a state to be pressed into the molds. The pressure of that part of the machine that forces the clay into the molds, is very considerable, making it so *dense* that one may lift it from the ground, immediately after it is cast from the mold, without its bending, breaking, or becoming distorted. This machine is easily worked, and portable, not very expensive, and I would recommend its use."

J. M. WAMPLER.



Horse Power, $200.



The Little Brick Maker, $70.

Digitized by:

INTERNATIONAL

ASSOCIATION
FOR
PRESERVATION TECHNOLOGY,
INTERNATIONAL
www.apti.org

BUILDING
TECHNOLOGY
HERITAGE
LIBRARY

https://archive.org/details/buildingtechnologyheritagelibrary

From the collection of:

NATIONAL
BUILDING
ARTS
CENTER

http://web.nationalbuildingarts.org